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(54) System for digital radio communication between a wireless LAN an a PBX

(57) A wireless local area network for digital radio communication between remote devices and a PBX telephone system, wherein the remote devices can access and use the voice message features in the PBX and the data bases on a host computer and servers. A wireless phone is provided for voice and data communication through the PBX or a CO telephone line with remote locations or the Internet using digital data packets and standard Internet Protocol. In a preferred embodiment ofthe invention, the remote device is a cash register comprising a bar code scanner and a phone. Ratio communication between the register and a host computer is carried out over two channels, a first channel for data communication and a second channel for voice communication.

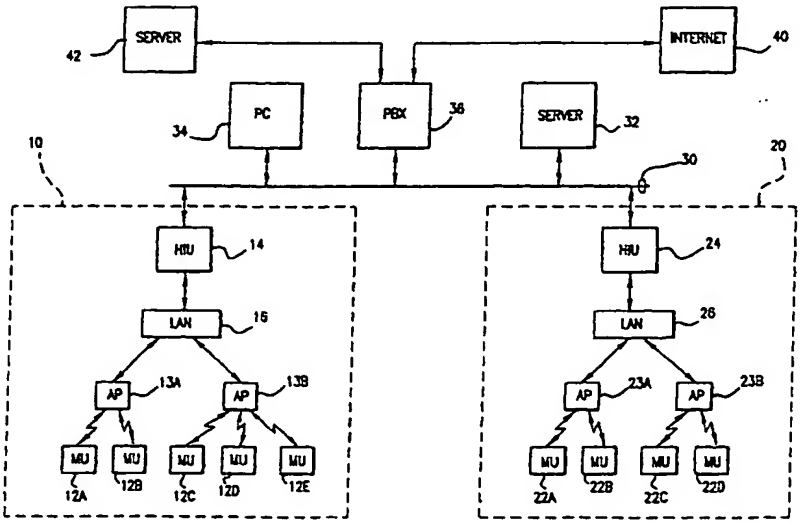

FIG.1

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 99 10 0655

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	EP 0 744 856 A (AT & T CORP) 27 November 1996 (1996-11-27) * the whole document *	1-5,8,10	
X	US 5 349 638 A (PITRODA SATYAN G ET AL) 20 September 1994 (1994-09-20) * column 1, line 55 - column 3, line 31 * * column 4, line 5 - column 5, line 20 *	1-4,6,7	
A	US 5 388 150 A (GU JING L ET AL) 7 February 1995 (1995-02-07) * column 5, line 18 - column 7, line 18 *	1-4,6,7	
X	EP 0 781 016 A (SONY CORP) 25 June 1997 (1997-06-25) * column 12, line 5 - line 22 *	1-4,9	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	15 April 2004	Gkeli, M

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

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LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 99 10 0655

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-5,8,10

   A wireless LAN for digital radio communication between remote devices and a PBX telephone system.

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2. claims: 1-4,6,7

   Phone construction details.

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3. claims: 1-4,9

   A portable terminal having a unique IP address on the system.

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that transmits data to an AP by digital radio communication.)

[0016] In another preferred embodiment of the present invention, a portable terminal having an integrated machine code reader and a radio for communication with an AP connected to a PBX is provided with a display for illustrating help and instructional files associated with an item identified with the machine code reader and for data downloaded from the LAN.

[0017] The information accessed through the PBX can be downloaded to the hand-held terminal and presented in any number of forms. The information can include messages from the PBX's voice mail server, e-mail, or data from remote devices. The data can be presented in the form of a still picture, text, audio or as video. The use of standard data protocols such as those used currently on the Internet permit wide area accessibility over commercial and closed communication networks on any number of hardware platforms.

[0018] A preferred alternative embodiment of the present invention includes machine readable coded labels having one or more remote file location, such as uniform resource locators ("URLs") used to reference sites on the world wide web. These URLs are used by the portable terminal to retrieve data files from various local and remote addresses available over a wireless communication network. The machine coded labels are preferably encoded with a high-density bar code such as PDF417. These URLs can be presented on the terminal display in the form of a hyperlink which submits a data retrieval request to a remote address upon selection. The displayed hyperlink could be presented on the display as either a direct address (URL) or a highlighted title for the address.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] The present invention will be understood and appreciated more fully from the following detailed description, taken in conjunction with the drawings, in which:

FIG. 1 is a general block diagram of a system employing a preferred embodiment of the present invention;

FIG. 2 is a preferred embodiment of a portable terminal of the present invention;

FIG. 3 is a functional block diagram of the basic subcomponents of a preferred embodiment of a portable terminal of the present invention;

FIG. 4 is an alternative preferred embodiment of the present invention used in a self-scanning application;

FIG. 5 is a cross-sectional view of the portable terminal illustrated in FIG. 4;

FIGS. 6A, 6B, 6C and 6D are various configurations of the system of the present invention;

FIGS. 7 is a flow chart of a call prioritizing system employing a preferred embodiment of the present invention;

FIGS. 8A and 8B are general functional block diagrams of alternative preferred embodiments of a telephony system used in a portable terminal of the present invention;

FIG. 9A is a preferred embodiment of a preferred wireless phone used in the present invention.

FIG. 9B is a preferred embodiment of a cash register and digital phone;

FIG. 10A, 10B, 10C and 10D are functional block diagrams of a preferred embodiment of a phone and an access point connecting to the bus of a host device;

FIG. 11 is an alternative preferred embodiment of the present invention used in a self-scanning application.

FIG. 12 is an alternative preferred embodiment of a terminal system for use by an attendant in fulfilling customer orders.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0020] In the preferred embodiment of the present invention, radio modules are used for digital data communication between MUs and an AP connected to an Ethernet. A PBX is connected to the Ethernet and the MUs can communicate with the PBX either directly or through a HIU which can provide routing or bridging functions. The MU can connect to remote computers or servers through the PBX and can also access the voice mail features of the PBX.

[0021] In another preferred embodiment, when a PBX is not available, radio modules connect to a HIU. The HIU has a minimum of two interfaces, one interface is for a phone line connection and the second interface is for one or more radio signals from wireless devices. The HIU can connect to commonly available Central Office ("CO") lines, including but not limited to POTS (Plain Old Telephone Service), ISDN (Integrated Services Digital Network), and T-1 circuits. The HIU uses PIP (Point-to-Point Protocol) to communicate with the Internet or remote computers. The wireless devices can be Mobile Units, such as wireless phones, pagers, notebook computers or a variety of other portable devices provided with a means for radio communication. The stationary devices can be computers, printers, file servers, fax machines, LANs and WANS. The HIU can be provided with additional interfaces for Ethernet ports and jacks for wired "standard" type phones can be added.

[0022] The Mobile Units of the present invention employ a wireless digital radio for communicating data to a HIU over a wireless network. The network can be either a local area remark such as Symbol's SPECTRUM24® spread spectrum frequency hopping communication network, or a wide area communication network system, such as those employing a cellular dig-

[0034] Collection of data is preferably performed by a bar code scanner in the pen 73 or integrally mounted scanner 75. The scanner reads one and two dimensional bar codes such as the ubiquitous UPC code and PDF 417 code. In an alternative embodiment of the present invention, the scanner is detachable from the terminal and is provided with either a short range radio link and its own battery supply or a wired connection.

[0035] The portable terminal 70 communicates with a PBX via the AP on the Ethernet or with a HIU through a wireless radio 80. In a preferred embodiment of the present invention, the radio 80 is a Symbol SPECTRUM24® PCMCIA Type II card communicating over a local area network employing a frequency-hopping communication system conforming to IEEE P802.11-1997. The standard is available from IEEE Standards Department, 445 Hoes Lane, P.O. Box 13311, Piscataway, NJ 08855-1331. The standard is incorporated herein by reference and shall not be further discussed. The system employs data throughput of at least one mega bit per second. Depending on the volume of data being transmitted, discrete communication systems such as SPECTRUM ONE®, also available from Symbol Technologies, Inc., may also be used. Moreover, many other frequency bands and data encoding schemes which provide adequate bandwidth and security can be employed.

[0036] The ergonomic design of the portable terminal shown in FIG. 2 permits the terminal to be used in either a horizontal configuration along line A-A, or in a vertical configuration relative to line A-A. The terminal is provided with a reconfiguration key setting which permits the video system to automatically reconfigure its display to reflect the user's preference. The reconfiguration key 79A will automatically reconfigure the video display to change the display configuration from the first configuration, e.g., landscape, to a second configuration, e.g., portrait. The reconfiguration function permits a facility to connect the portable terminal to a fixed station in more than one arrangement.

[0037] FIG. 3 illustrates the basic subcomponent systems of the portable terminal shown in FIG. 2. As shown, the system 70 includes a CPU 701 which communicates with a radio 702, a scanning subsystem 704, a video subsystem 705, a telephone subsystem 706, a data input device 707, and an EAS tag activation/deactivation circuit 708.

[0038] FIGS. 4 and 5 illustrate an alternative embodiment of a portable terminal of the present invention. In FIG. 4, terminal 100 is provided with a display 110. The display is a partial CGA, VGA or super VGA display having a multi-contact navigational pad 106 for scrolling through the full video image. In addition, the terminal 100 is also provided with a scanner 120 for reading bar code labels 122, three input buttons 101, 102 and 103, a speaker 104 and a microphone 105. The portable terminal 100 is equipped with a radio 108 and a rechargeable battery 107 inside the casing, shown in FIG. 5. Also shown in FIG. 5 are the main circuit board 111, the scan engine 120A, and battery recharging terminals 107A and 107B which are connected to a recharging circuit (not shown). A separate circuit board 109 is also shown for the optional telephony application. A battery overcharge protector circuit is also included but not shown.

[0039] FIGS. 6A, 6B, 6C, 6D and 6E illustrate various components of a system employing different configurations of preferred embodiments of the present invention. FIGS. 6A, 6B, 6C and 6D show the MUs connecting to an Ethernet through APs. FIG. 6E shows the MUs connecting to a Token Ring network through APs. The APs provide access to the Ethernet or Token Ring network and each AP can simultaneously accept up to twenty-five radio signals. The network can be part of a local or wide area network that includes a PBX 630, or the APs can be connected to a HIU 600 that connects to a network comprising a PBX 630. When the APs connect to the HIU 600, the HIU 600 functions as a bridge or router for communications between the APs and the PBX 630.

SYSTEM CONFIGURATION

[0040] FIG. 6A shows a system wherein the APs 610, 620 for the MUs 612 A-C, 622 A-C, the HIU 600 and a server 640 are connected to the same Ethernet backbone. Communication from the MUs 612 A-C, 622 A-C can go directly to the PBX 630 or to one of the other devices on the Ethernet. Data can be processed in the HIU 600 or accessed from the server 640. Phone communications can be established with other devices in the network, such as between two MUs 612A and 622A, without going through the PBX 630.

[0041] FIG. 6B shows a system wherein a LAN 670 is connected to an Ethernet on a WAN 650 through a HIU 600. In this configuration, the HIU 600 provides routing or bridging functions between the LAN 670 and the WAN 650. The PBX 630 is located on the WAN 650 and only communications with devices outside the LAN 670 are passed through the HIU 600 to the WAN 650. In addition to LAN 670, other networks, such as LAN 680 and WAN 690, and devices such as server 640 can be connected to WAN 650 for communication with the PBX 630.

[0042] FIG. 6C shows a system wherein a PBX is not used and the HIU 600 provides the interface with a telephone system. The HIU 600 provides voice mail functions, as well as data storage and processing functions. Telephone communications with outside locations connect with a CO 602 line. The CO 602 can be almost any commercially available system, such as POTS, ISDN or T1. Data can be accessed by the MUs 612A-C, 622A-C from a server 640 in the local network as well as from remote devices accessed over the telephone system.

[0043] FIG. 6D shows a system wherein a bridge or router 675 is used to connect a LAN 670 with a WAN 650 that connects to the PBX 630. MUs can communicate with devices in the LAN 670 without connecting to the PBX 630. The router 675 only passes data from the

play a menu of additional information that the user can access. Such information can include product inventory, order status, accounts payable and receivable, meeting notes, records of previous conversations with the caller and personal information about the caller, such as the names of the caller's family members.

[0052] In order to provide hands-free operation of the MU, the MU can be provided with a port for a microphone and a port for a receiver or a single port that combines both functions. This permits the user to carry on a conversation with a caller while viewing the MU's screen and pressing buttons on the MU to access data from remote files.

[0053] When an MU is configured for voice communication, it can access all of the features of the PBX's voice mail system. The user can receive messages, skip messages, delete or save messages, record a new announcement or message, forward calls to another location, change the address of his location, schedule message reminders, and broadcast messages over the network. The user can also use the on-line directory system in the PBX to connect to another user through a PBX extension or over the LAN.

[0054] Voice recognition by a computer requires a high quality voice signal and a substantial amount of processing capacity to perform the digital conversion and voice identification. Digital radio communication provides a high quality voice signal that is not available with an analog radio signal. The high quality digital radio signal permits voice recognition processing functions to be shifted from the MU's processor to the HIU or another device on the receiving end that has greater processing capacity. The present invention allows the MU user to use a voice processing system as a security check for sensitive files stored on remote devices or to dictate letters or messages that will be saved as a text file. Through an MU, a user can dictate and send e-mail from remote locations or prepare letters using the system when he does not have access to a keyboard.

[0055] Illustrated in FIG. 8A is a block diagram of preferred embodiment of a telephony system employed in a terminal of the present invention. In FIG. 8A, a PCM CODEC (coder/decoder) chip 330 is connected to a CT8015 DSP (digital signal processor) chip 320 and a 6805 processor chip 310. This chip set is connected to a communication part of the terminal which is provided with a data input user interface 301, and a phone program 302 stored in read only memory. The phone program utilizes a TCP/IP or other protocol stack 303 which communicates packet switched data over a SPECTRUM24® radio PCMCIA card 304. The audio input and output are configured to be placed next to the user's ear and mouth similar to a standard telephone handset and to provide an echo, so that a user can hear what he is saying when he speaks into the microphone. This configuration is preferred in any system in which the terminal is being held up to the user's head for use, such as that shown in FIG. 4.

[0056] The 6805 processor chip 310 sends and receives packets of data between the CT8015 DSP chip 320 and the serial port 305. The user interface software is designed to identify the selection of an IP address on the display. Alternatively, the user interface 301 could simply send a telephony request message and wait for a "telephone communication channel open" command to be received from the controller over the wireless communication link.

[0057] The phone program is a memory resident (TSR) program and handles the actual processing of audio communication which includes processing user interface data, routing the packets form and to the SPECTRUM24® network, and routing packets form and to the local CT8015 chip. The phone program 302 also performs the handshaking procedure with the CT8015 chip 320.

[0058] Illustrated in FIG. 8B is an alternative preferred embodiment ofthe architecture which may be used in a device of the present invention to effectuate telephony application. The architecture illustrated in FIG. 8A is preferred in systems wherein the telephony application is to be added through com port com 1. The architecture illustrated in FIG. 8B is preferred in systems in which the application is to be built as an integral part of the system architecture.

THE PHONE

[0059] FIG. 9A shows a preferred embodiment of the present invention in which the MU is a wireless digital phone 800. The phone 800 is provided with a liquid crystal display ("LCD") 801 that displays messages, caller IDs, data and commands entered by the user and a twelve button key pad for entering phone numbers and data. An earpiece 809 and a microphone 804 are used for voice communication. In a preferred embodiment of the phone 800, a port 822 is provided for connecting a headset and microphone to allow the user to view the LCD 801 and operate the key pad 811 while talking on the phone 800. A volume control button 806 permits the user to control the volume for voice communications and the button can also be configured as an alternate scroll. Data is entered using the key pad 811 and as the data is entered, it is displayed on the screen 801. When the screen 801 is full, depressing the enter button 807 saves the data in the phone's memory until it is transmitted by depressing the send button 813. This allows multiple screens of data to be sent in a single transmission. In addition, the phone 800 is provided with an LED ("light emitting diode") indicator 810 which flashes to indicate that a call or a message is being received. The phone 800 is also provided with multiple audio annunciations, including various rings and tones, and can be programmed to vibrate to announce a call or message. The phone 800 can be hardwired to a host device, such as a cash register or a PC, or an antenna 812 can be used for radio communication. When the wireless embodi-

configured into the phone 800 as part of the setup sequence. It also has an IP subnet mask and a default gateway address. The IP address, together with the MAC address, are the "real" addresses for the phone 800 in that the connection management protocols (as defined in International Telecommunications Standard ("ITU") H.323) are based on IP addresses. The IP address alone is not sufficient to connect the phone 800 to either an outside POTS system and/or a PBX. The phone 800 requires an "extension" address in order for it to be addressed by non IP phones. This extension address can range from one to five digits and is usually the least significant portion of a conventional seven or ten digit phone number. Similarly, an extension address is required by the IP phone 800 in order for it to connect to these non IP phones.

[0068] Each phone 800 has an extension number which can be mapped to IP addresses and correspond to other IP phones. Other extension numbers are the "real" address of a non IP phone on a PBX. The number of digits in an extension is a constant for all phones and is set on a site specific basis. The mapping from extension to either IP address or PBX line is also site specific and is the same for all phones. The mapping is downloaded to each phone 800 and stored in the phone's flash memory. When dialing an extension, the mapping will be transparent to the user. A Gateway between a PBX (or POTS) and the IP phone system contains the same mapping of extensions to IP addresses.

[0069] In addition to extensions, the system also maps "Names" to either an IP address or an extension. A name can be a sequence of up to sixteen ASCII characters. These names are mapped to either an extension or an IP address. This mapping is global on a site specific basis and is downloaded into each phone 800 and stored in the phone's flash memory. The names are sorted in alphabetical order and the mapping is transparent to the user. Like extensions, Names are an optional feature and are not required for IP phone operation. Phone users can use full or partial IP addresses or extensions instead of Name mapping.

[0070] The phone 800 is provided with a locally defined "speed dial" mechanism. The phone 800 can hold up to one hundred "two digit" speed dial numbers which are programmed by the user. Each number is mapped to up to twenty characters that are stored in the phone's memory as a text string. The speed dial mappings are local to each phone 800 and may be altered at any time by the user.

[0071] The phone 800 supports a variety of dialing mechanisms. These include: direct entry of complete IP addresses, direct entry of partial IP addresses, direct entry of an "extension," "speed dial" operation, redial of previous number, the use of "names" that are internally mapped to an IP address, and "9" to access an outside line. The dialing process begins by pressing any of the dialing related buttons, including: the "*" button 803 or "#" button 802, the recall ("RCL") button 818, either of the scroll keys 806, or the "NAM" button 819. If the first key pressed is a numeric key (0-9), the phone 800 assumes an extension is being dialed. The user enters the appropriate number of keys to identify the extension as defined by the site administrator. The number is displayed on the LCD 801. Errors may be removed by the "CLR" button 820. As each key is pressed, the corresponding DTMF tone is generated. The call setup process is started by pressing the "SND" button 813. The dialing process can be terminated at any time by pressing the "END" button 814.

[0072] If the first key pressed is the "*" button 803, the phone 800 assumes an IP address is being entered. The user can enter a partial or complete IP address using the A.B.C.D format in which the values A, B, etc. are from 0 to 255 decimal. The "dots" are entered via the "*" button 803. Errors are corrected via the "CLR" button 820, The address is displayed on the LCD 801. No DTMF tones are generated although a "click" will be generated with each key pressed. If an illegal address is entered, a "beep" will be generated. Address value checking is performed on each three digit sequence (i.e. the values between each dot). Addresses are terminated and the call setup process initiated by pressing the "SND" button 813. If a partial IP address is entered (i.e. values with fewer than 4 "dots"), the phone 800 fills in the remaining portion of the IP address using its own IP address. The "filling in" is done in groups of 8 bits. Thus, if the user presses the "*" button 803 followed by one to three digits (which has a value which is referred to as "X" and can be between 0-255) and then presses the "SND" button 813, the resulting address is A.B.C.X, where A.B.C come from the phone's own IP address. Likewise if the user enters "X*Y and then presses the "SND" button 813, the resulting address is A.B.X.Y.

[0073] If the first key pressed is the "RCL" button 818, the last number dialed is displayed on the LCD screen 801 (essentially a "redial" command). When the user presses the "SND" button 813, the call setup process is started. When the user presses the "RCL" button 818 repeatedly, the phone 800 cycles through each of the last ten numbers dialed. The phone 800 stores the address of each call made in a LIFO queue structure and the user can use the "RCL" button 818 to access this queue. When the desired number is found, the user presses the "SND" button 813 to initiate the call setup process. If the user does not want to use any of the numbers in the LIFO queue, pressing the "END" button 814 resets the phone 800 to the predialing state.

[0074] Pressing the "MENU" button 816, the "NAM[E]" button 819, or other similar buttons places the phone 800 in the corresponding mode. If the user presses the "RCL" button 818 and then enters one or two digits, the corresponding speed dial entry will be fetched and displayed on the LCD 801. The user may scroll the speed dial values up and down via the scroll buttons 806. The selection by the user of one of the numbers listed either via the "SND" button 813 or the select button 807 initi-

quently used tasks for which a key would be allocated if more keys were available. The commands entered using the "FCT" button 817 do not effect the permanent configuration of the phone 800. When the user presses the "FCT" button 817, the list of available functions are displayed on the LCD 801. The user may either scroll through the list and select a function using the UP/DOWN buttons 802 and 803 and select button 807 or enter the function code via the numeric keys 811. The phone 800 can support standard functions, as well as user specified functions. These functions include: broadcast mode, broadcast call back, call transfer, ring tone volume/type, volume level, answer mode, battery status, network status and enter pager mode.

[0083] The "MENU" button 816 is used to access pager functions and to configure the phone 800. When the "Menu" button 816 is pressed, the LCD 801 displays a set of menus which can be used to send and display page messages, configure the phone's network parameters, perform diagnostics, examine statistics, etc. When in the Menu mode, the phone 800 accepts calls. If the user "answers" the call, the phone 800 exits the menu mode. The user may disable incoming calls entirely via the "FCT" button 817. Some of the parameters that may be configured from the Menu mode include: IP addressing, IP address, subnet mask, default gateway, wireless LAN parameters, Net ID (i.e., the extended service set--"ESS"), and preferred application programming interface ("API" or basic service set--"BSS").

[0084] The Menu mode can also be used to set the volume and type of ring tone. Ring types include: audio (with various styles of ring), vibrator motor, and flashing screen. The Menu mode is also used to control the answer mode of the phone 800 (i.e. auto, single key, any key), disable call reception, edit the speed dial list, and specify the channels on the phone 800 that are capable of receiving broadcast messages and the default outgoing channel.

[0085] The phone 800 can also support a Telnet mode of operation in which a user signs onto a remote system network directly as a user of that system. Telnet TCP/IP is the standard Internet protocol for remote terminal connectivity. In this mode of operation, the user establishes a Telnet connection to a host machine and uses the phone 800 as a Telnet terminal. The keys 811 are mapped to a restricted subset of the normal keys of a Telnet VT100 compatible terminal. When the Telnet mode is active, the phone 800 is limited to one active phone call at a time. However, the user can switches back and forth between the voice and data modes via the "HOLD" key, much the same way as switching between two phone calls.

[0086] FIG. 9B shows a preferred embodiment of the present invention in which the phone 800 is connected to a cash register 825 by a cable 826. In an alternative embodiment, the phone 800 is a wireless phone and it communicates with the register 825 by digital radio communication. The register 825 can also be provided with a bar code scanner. The register 825 and phone 800 share the same radio for communication of voice and data between the register 825 and a HIU or PBX.

[0087] FIG. 10A illustrates a block diagram of a radio card 830 that is used as an AP for connecting a plurality of radio signals to a host device. The radio card comprises radio circuits 831 for a frequency hopping spread radio, interface circuits 832 to interface the radio circuits 831 with the other components on the card 830, a central processing unit ("CPU") 833, flash read only memory ("ROM") 835, static random-access memory ("SRAM") 834 and PCMCIA interface circuits 836 that also provide power management support and system integration functions. An ISA ("Industry Standard Architecture") card 838 plugs into a host device and comprises a bridge chip 839 that interfaces the radio card 830 with the bus 840 of the host device. The radio card 830 also has a connection for an antenna 837. The antenna 837 can be mounted on the radio card 830 or it can be connected to the host device's internal or external antenna. The radio card 830 can be mounted on the ISA card 838 or it can be connected to the host device's PCMCIA port.

[0088] FIG. 10B illustrates a block diagram of the embodiment of the invention depicted in FIG. 9B, wherein the phone 800 is connected to a host device 825 by a hard wired connection 826. The radio card 850 is located in the host device and comprises radio circuits 851, a radio interface 852, SCRAM 853, flash ROM 854, a CPU 855 and a PCMCIA interface 856. The radio card 850 also has circuitry for supporting the phone 863. This circuitry comprises a digital signal processor ("DSP") 858 and a coder/decoder ("CODEC") 860, as well as circuits for the phone's LCD 857 and key pad 859. The DSP 858 provides a means for processing voice communications and the CODEC 860 provides a means for coding and decoding voice communications. The radio card 850 connects through a bridge chip 871 to the bus 880 of the host device.

[0089] Voice communications are processed and coded/decoded in the radio card 850 and transmitted over the radio as digital packets in accordance with ITU Standard H.323; which is hereby incorporated by reference. These digital packets of information are used to communicate with third party servers employing standard TCP/IP and other standardized communication protocols to transmit/retrieve data. This allows the phone user to communicate over the Internet and it also allows the phone user to access sites on the Internet.

[0090] FIG. 10C illustrates a block diagram of a preferred embodiment, in which the phone is a wireless phone comprising a radio card 850A housed inside the phone. The phone communicates by radio with a radio in a host device, such as the radio shown in FIG. 10A. The host device is a computer that can also support other functions, such as a bar code scanner. The host device communicates with a HIU by radio communication or it can be connected to the HIU by a network, such as

play, and a wireless ring scanner. It is preferred that these components employ a wireless communication data line which permits multi-channel communication to the CPU component 562, and that the belt modules be connected using a flexible cable connector data bus.

[0099] The herein described embodiments of the present invention are intended to provide the preferred embodiments of the present invention as currently contemplated by the applicants. It would be obvious to anyone of skill in the relevant art based on the herein described examples without straying from the present invention that numerous modification can be made to the described preferred embodiments. For example, the portable terminal can take any number of forms including wearable solutions available from Symbol Technologies, Inc. and other portable solutions described herein. In addition, the graphical user interface can also be implemented as a number of different presentation schemes. Accordingly, the herein described embodiments are merely exemplary in nature and are not intended to represent every possible embodiment of the present invention.

[0100] According to its broadest aspect the invention relates to a system for digital radio communication, comprising: a telephone system (TS); a terminal comprising a first radio; an access point comprising a second radio; a bridge connecting said TS and said access point.

[0101] It should be noted that the objects and advantages of the invention may be attained by means of any compatible combination(s) particularly pointed out in the items of the following summary of the invention and the appended claims.

SUMMARY OF THE INVENTION

[0102]

1. A system for digital radio communication, comprising:

    a private branch exchange telephone system ("PBX");
    a terminal comprising a first radio;
    an access point comprising a second radio;
    a bridge connecting said PBX and said access point, wherein communications between said terminal and said PBX are established through said first and second radios and said bridge.

2. The system wherein said bridge comprises a host interface unit.

3. The system wherein said terminal is a point of sale terminal.

4. The system wherein said terminal comprises a phone.

5. The system wherein said PBX further comprises a voice messaging system.

6. The system wherein said phone is provided with a liquid crystal display ("LCD") and software for providing caller identification, wherein information regarding the incoming call is displayed on said LCD.

7. The system wherein said phone comprises an RS-232 serial port.

8. The system wherein said phone communicates over a wireless local area network using digital packets of information under Internet protocols.

9. The system wherein said phone is addressable with a unique Internet Protocol address.

10. The system further comprising a data storage device having a user specified caller priority table.

11. The system wherein said phone comprises a multi-tone ring feature having different rings for callers identified by said caller priority table.

Claims

1. A system for digital radio communication, comprising:

    a private branch exchange telephone system ("PBX");
    a terminal comprising a first radio;
    an access point comprising a second radio;
    a bridge connecting said PBX and said access point, wherein communications between said terminal and said PBX are established through said first and second radios and said bridge.

2. The system of claim 1, wherein said bridge comprises a host interface unit.

3. The system of claim 1, wherein said terminal is a point of sale terminal.

4. The system of claim 1, wherein said terminal comprises a phone.

5. The system of claim 4, wherein said PBX further comprises a voice messaging system.

6. The system of claim 4, wherein said phone is provided with a liquid crystal display ("LCD") and software for providing caller identification, wherein information regarding the incoming call is displayed on said LCD.

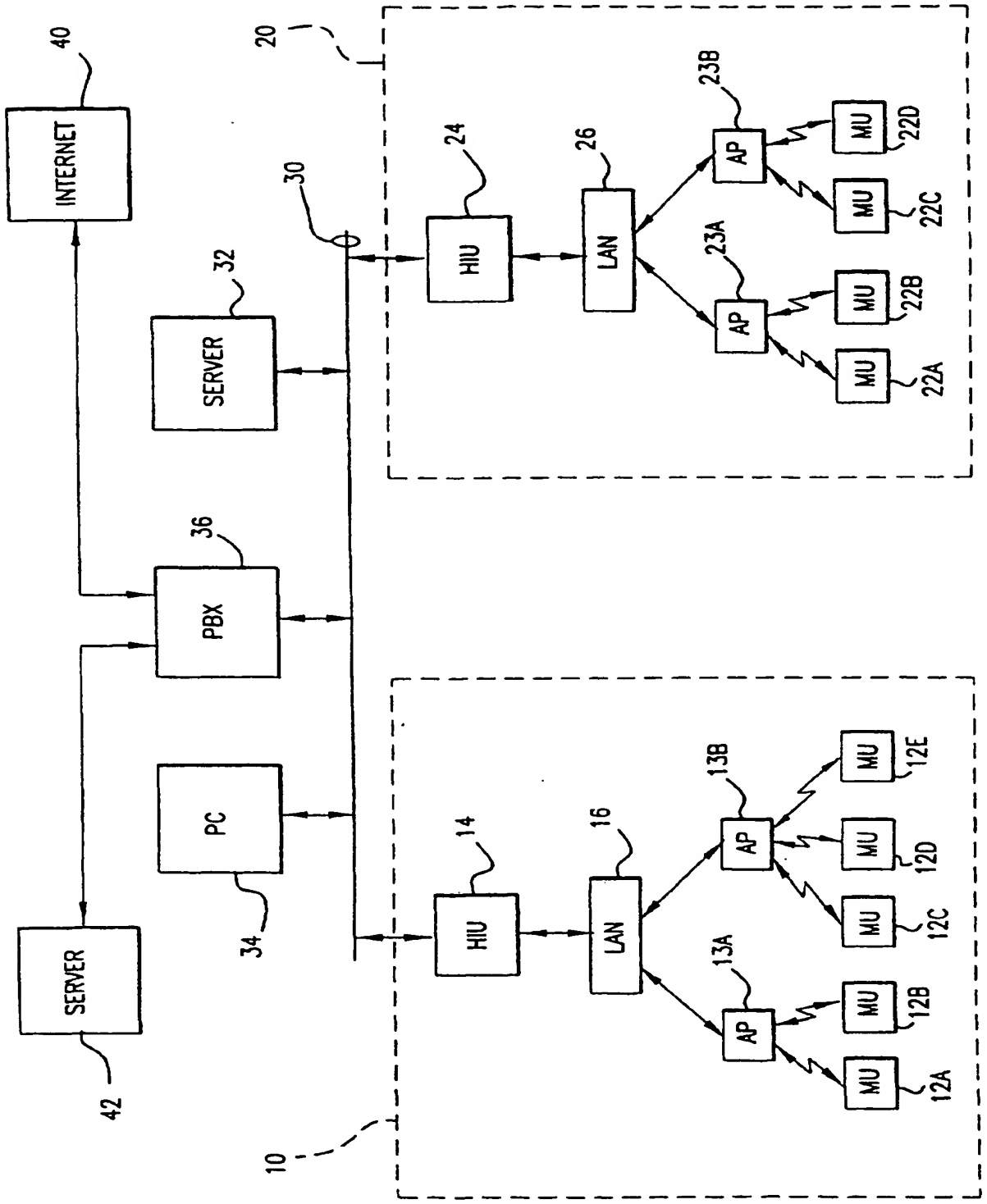
INTERNET
40
20
30
SERVER
32
HIU
24
LAN
26
AP
23B
AP
23A
MU
22D
MU
22C
MU
22B
MU
22A
PBX
36
PC
34
SERVER
42
10
HIU
14
LAN
16
AP
13B
AP
13A
MU
12E
MU
12D
MU
12C
MU
12B
MU
12A

FIG. 1

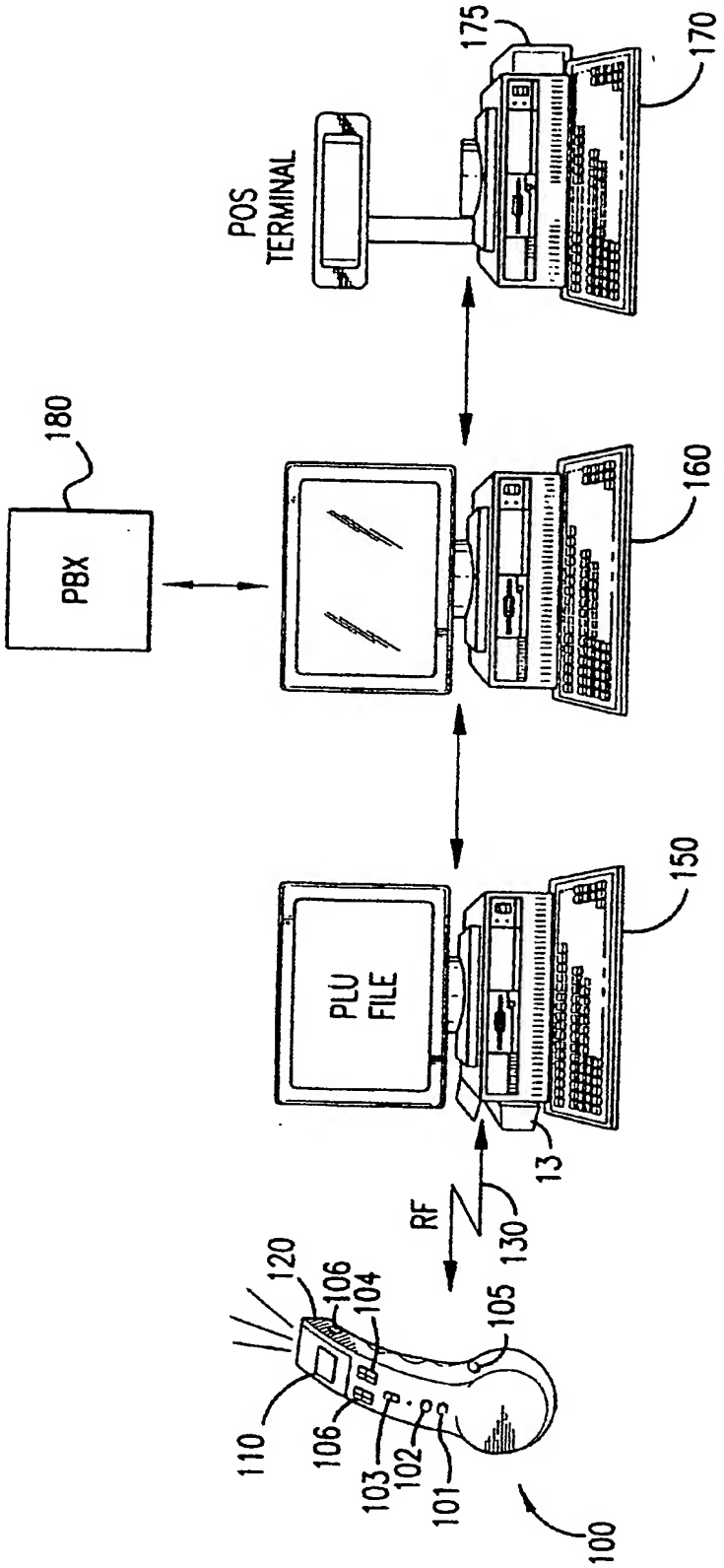
175
170
POS
TERMINAL
180
PBX
160
150
PLU
FILE
13
RF
130
120
106
104
105
110
106
103
102
101
100

FIG.4

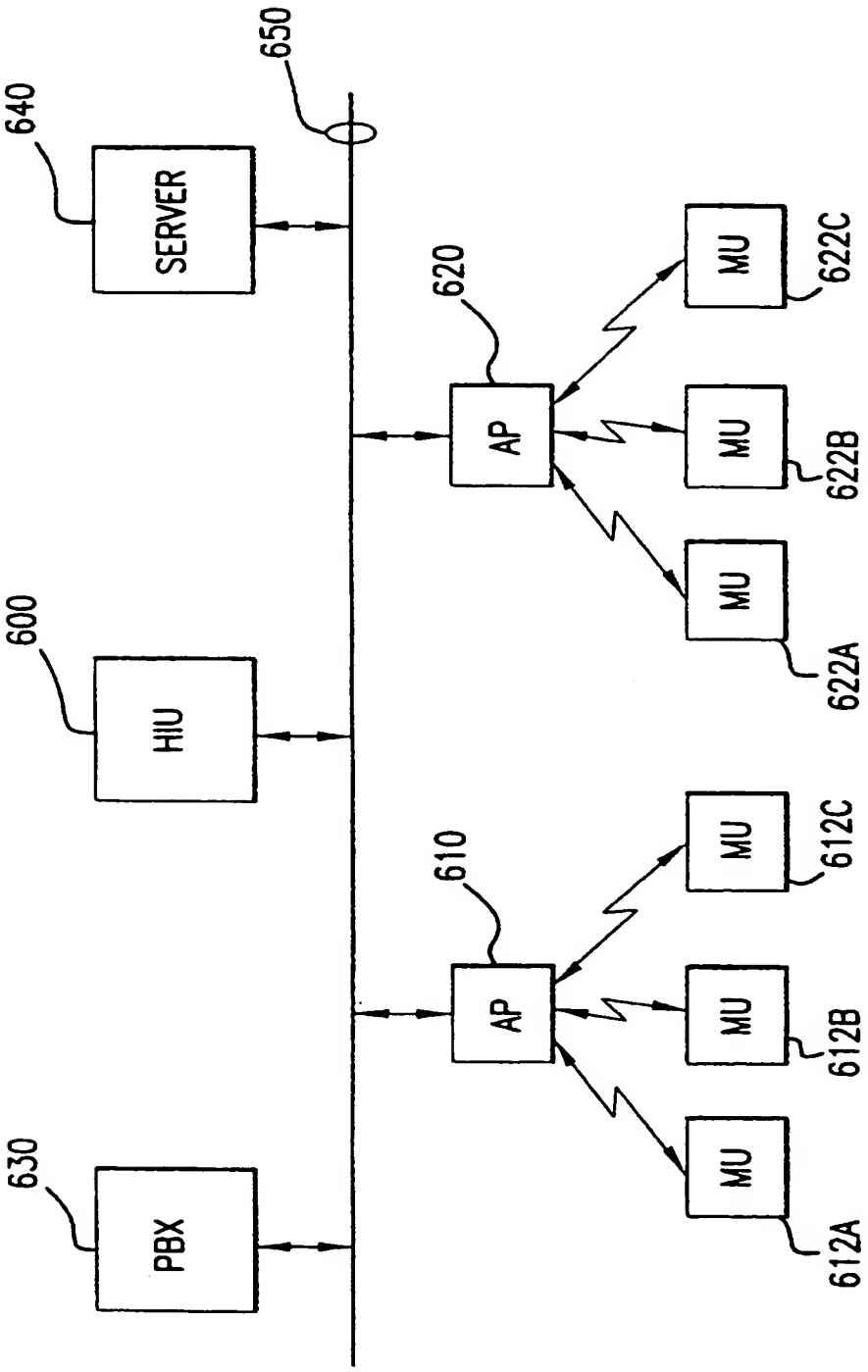
650
640
SERVER
620
AP
MU
622C
MU
622B
MU
622A
600
HIU
610
AP
MU
612C
MU
612B
MU
612A
630
PBX

FIG.6A

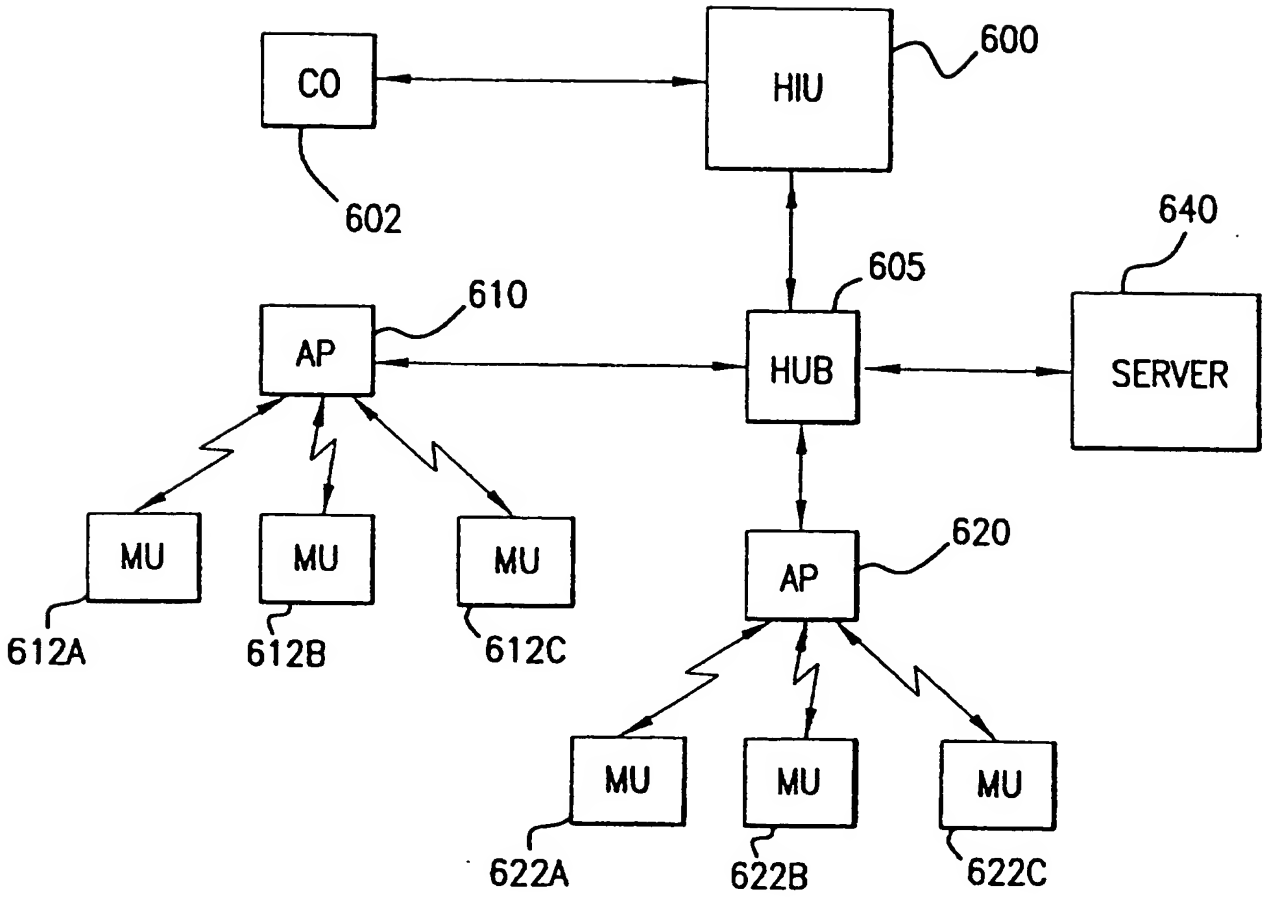
CO
HIU
600
602
640
605
610
AP
HUB
SERVER
MU
MU
MU
620
AP
612A
612B
612C
MU
MU
MU
622A
622B
622C

FIG.6C

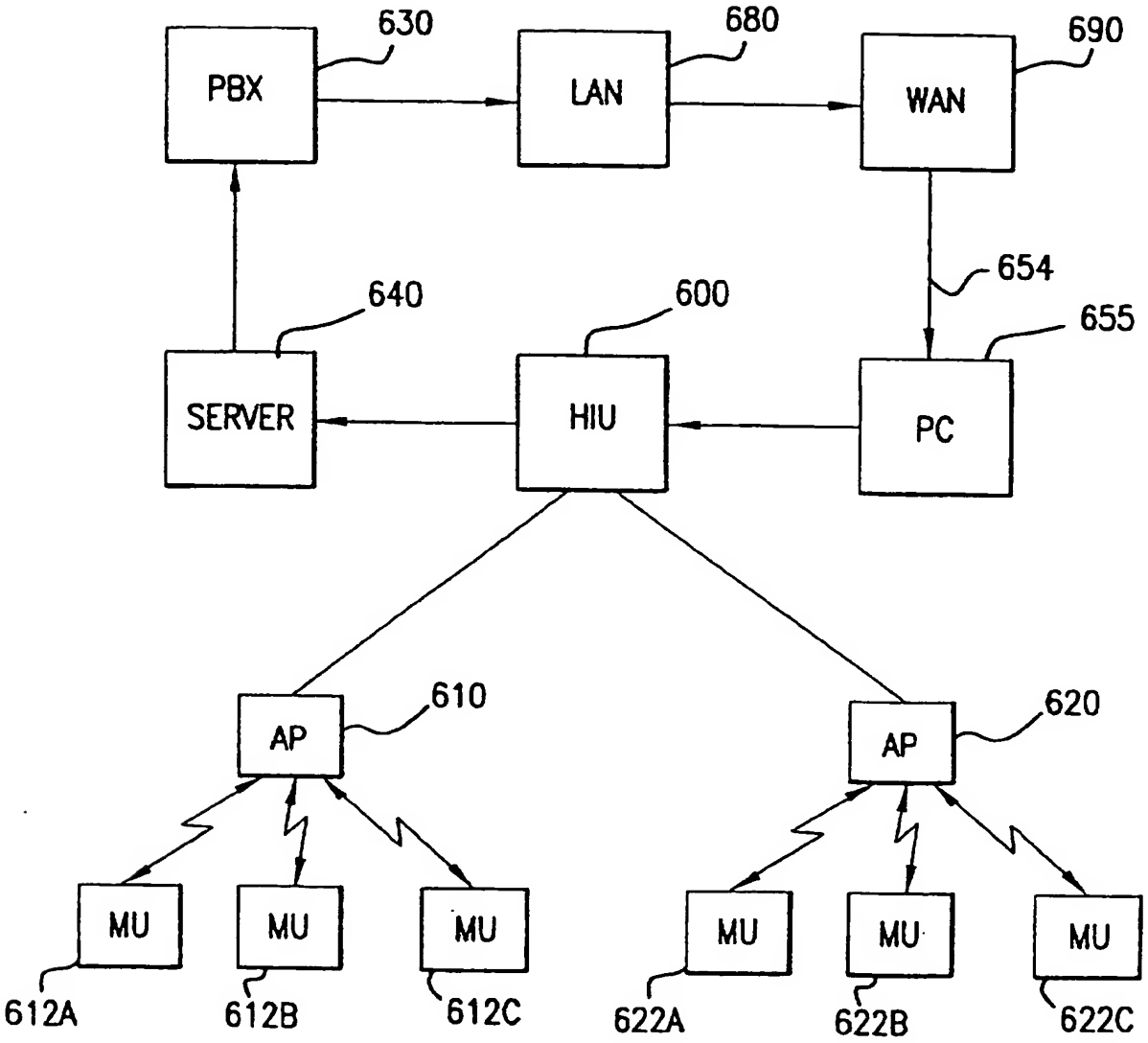
PBX
630
LAN
680
WAN
690
654
655
SERVER
640
HIU
600
PC
AP
610
AP
620
MU
MU
MU
MU
MU
MU
612A
612B
612C
622A
622B
622C

FIG.6E

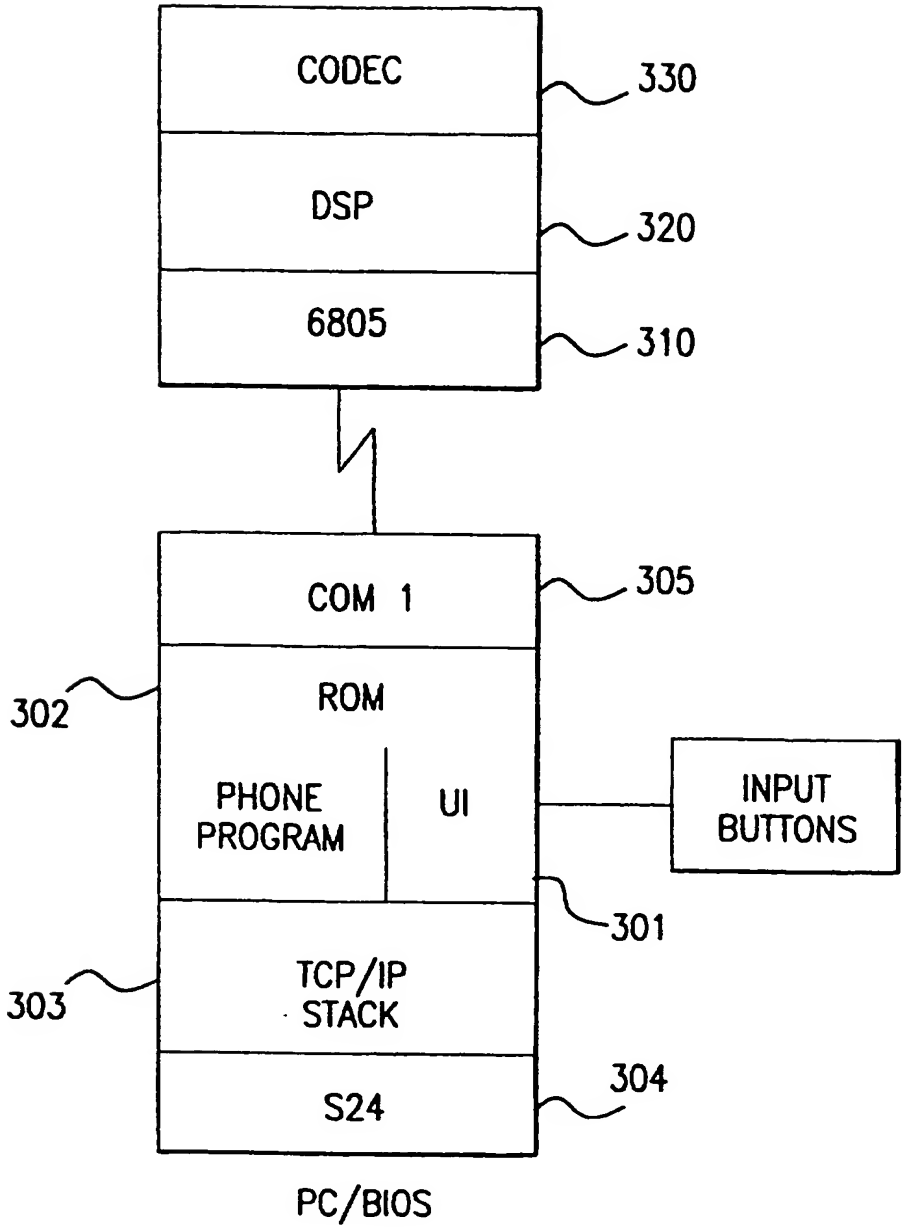
CODEC
330
DSP
320
6805
310
COM 1
305
302
ROM
PHONE PROGRAM
UI
INPUT BUTTONS
301
303
TCP/IP STACK
S24
304
PC/BIOS

FIG.8A

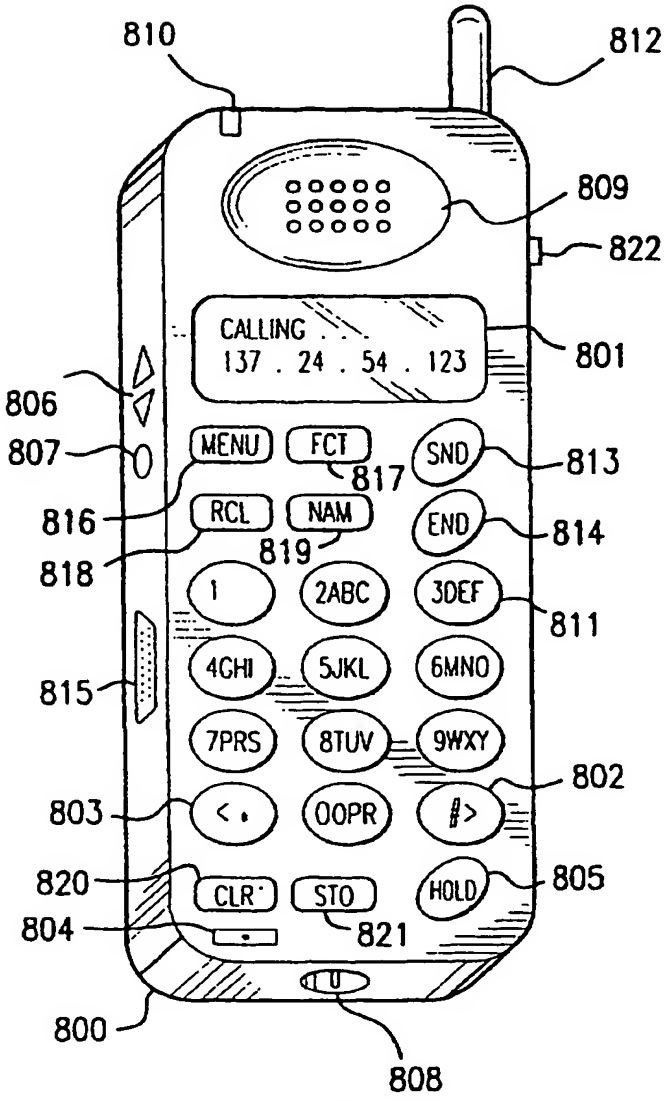
810
812
809
822
CALLING
137 . 24 . 54 . 123
801
806
807
MENU
FCT
SND
813
817
816
RCL
NAM
END
814
819
818
1
2ABC
3DEF
811
4GHI
5JKL
6MNO
815
7PRS
8TUV
9WXY
802
803
<.
OOPR
#>
820
CLR
STO
HOLD
805
804
821
800
808

FIG.9A

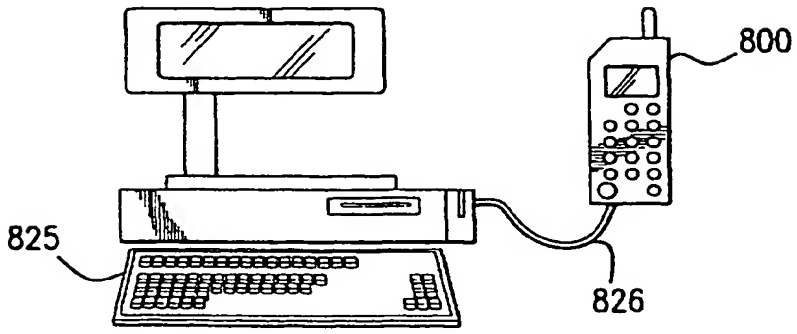
800
825
826

FIG.9B

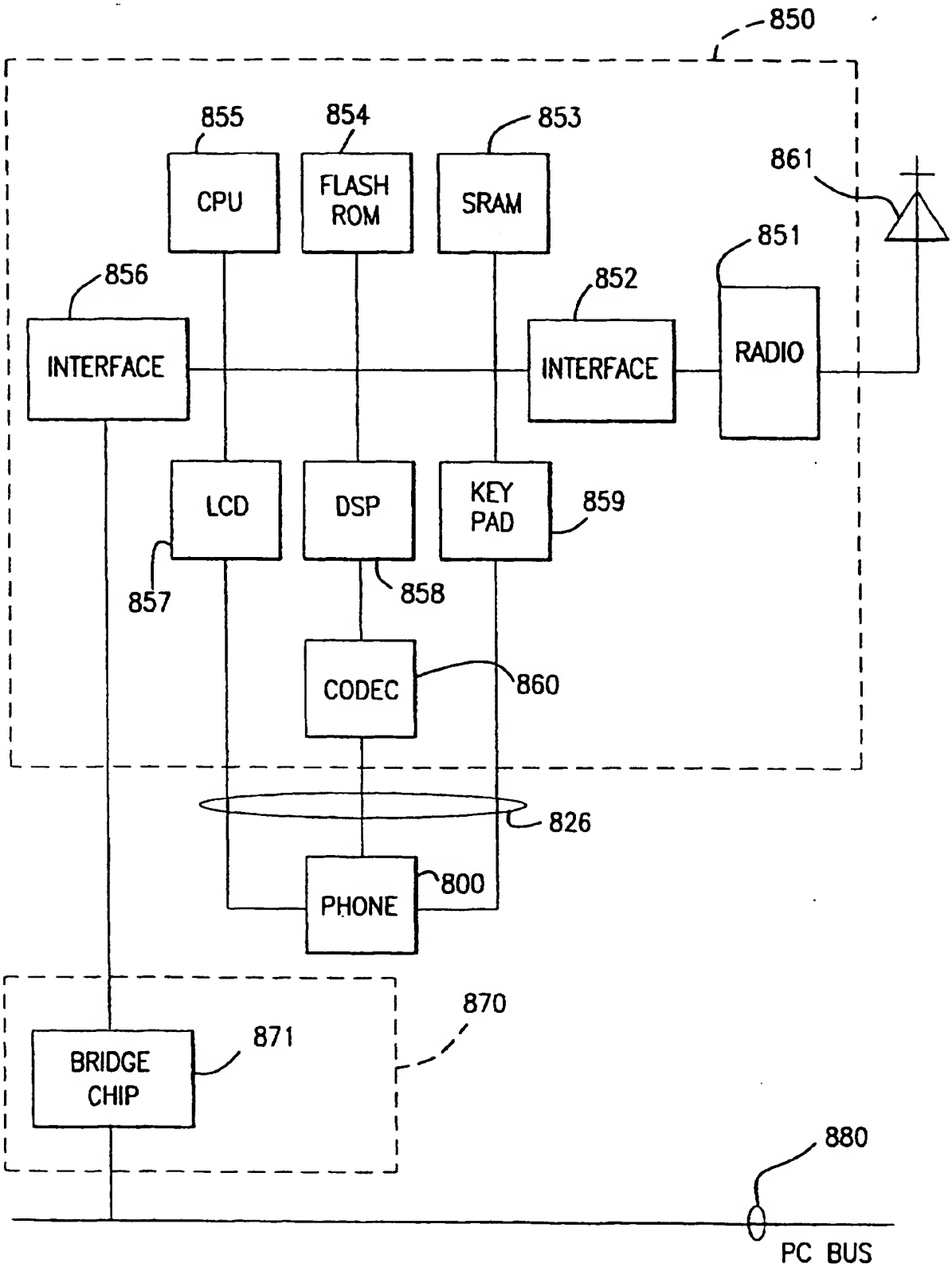
850
855
854
853
CPU
FLASH ROM
SRAM
861
851
856
852
INTERFACE
INTERFACE
RADIO
LCD
DSP
KEY PAD
859
857
858
CODEC
860
826
PHONE
800
870
871
BRIDGE CHIP
880
PC BUS

FIG.10B

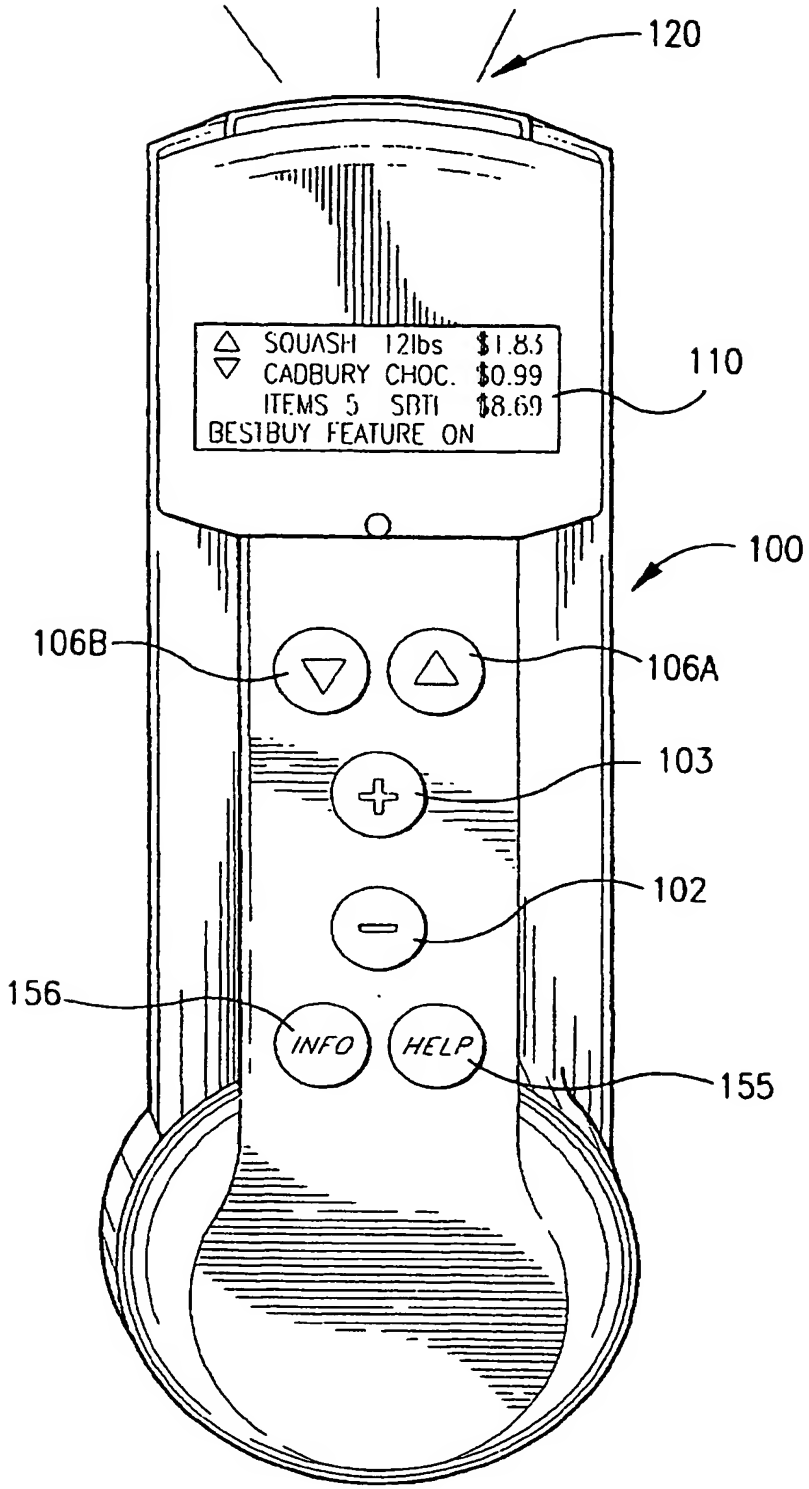
120
SQUASH 12lbs $1.83
CADBURY CHOC. $0.99
ITEMS 5 SBTI $8.69
BESTBUY FEATURE ON
110
100
106B
106A
103
102
156
INFO
HELP
155

FIG.11A

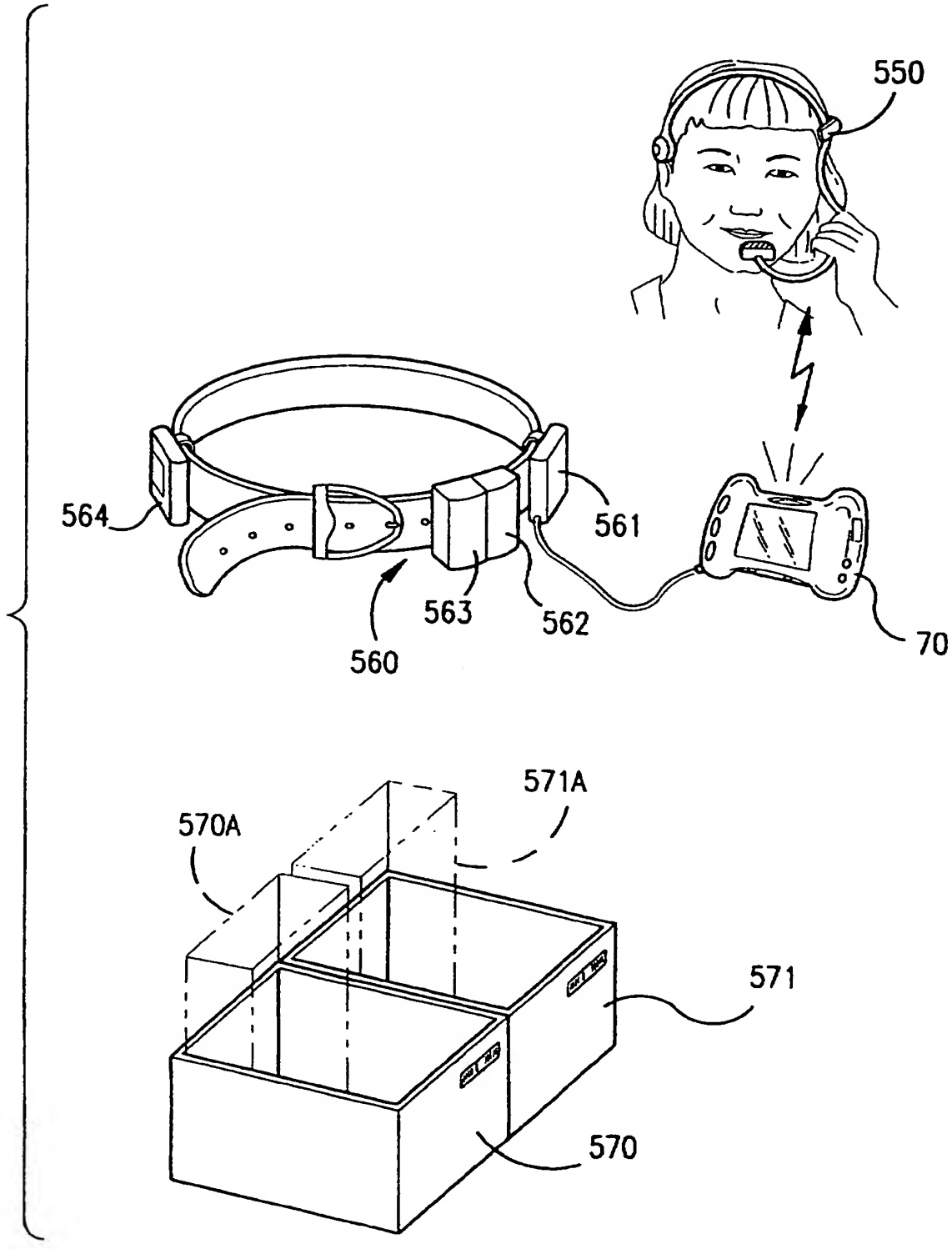

FIG.12